



Review of the Operations Division of the Operations & Maintenance Department

Report #98-01

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Office of Inspector General**

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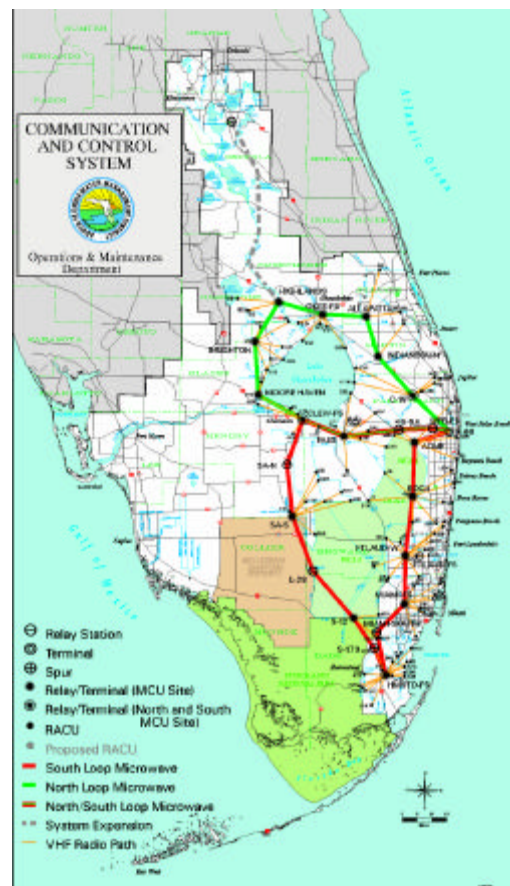
INTRODUCTION

The Director of the Operation and Maintenance Department (OMD) requested the Inspector General's Office to conduct a review of the Operations Control Center (the "OCC"). OMD wished to have an independent review conducted of the OCC, a component of the Operations Division of OMD. Several less formal reviews were conducted by the District. In order to accomplish the review we determined that it would be beneficial to enlist the assistance of an outside technical expert versed in the operations of the Central and Southern Florida Flood Control Project (C&SF). Accordingly, at our request, OMD engaged an engineer with expertise in hydrological systems to help us conduct the review.

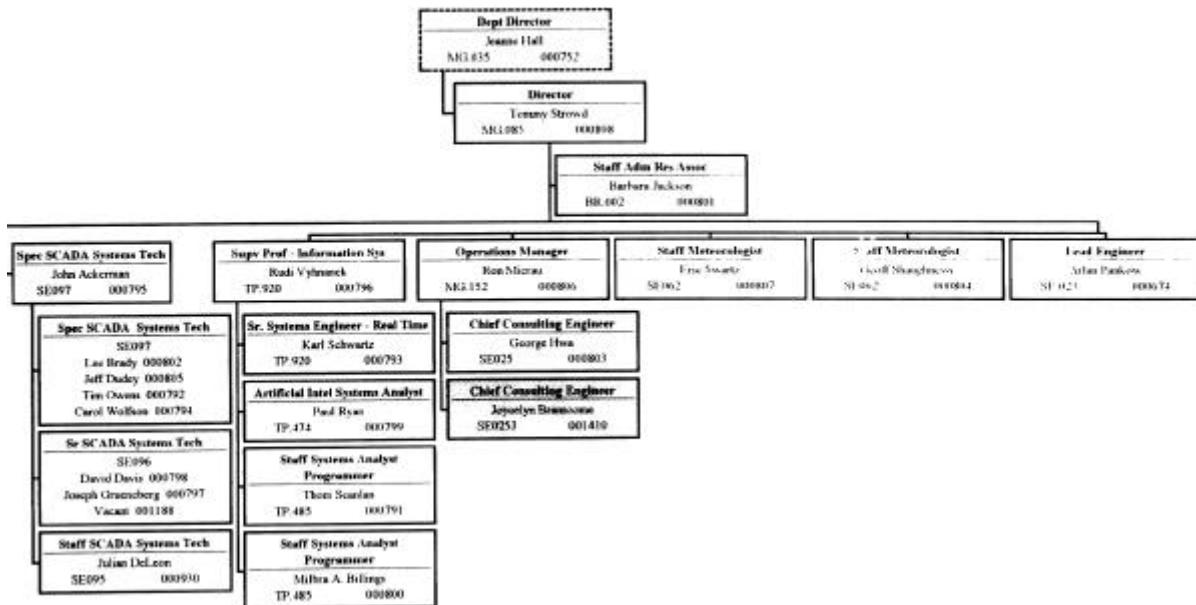
BACKGROUND

The Operations Division of OMD (the "Division") provides monitoring and control of the C&SF project which today includes 1,800 miles of canals and levees, 25 major pumping stations and about 200 larger and 2,000 smaller water control structures. This involves making coordinated decisions with other District Departments as well as with the U.S. Army Corps of Engineers (the "USACE"). The USACE controls water storage areas, namely Lake Okeechobee and Water Conservation Areas 1, 2A and 3A outflow structures. Liaison and coordination with other agencies, special interests, and stakeholders are also vital.

The Division consists of four sections, the OCC and three sections that support the OCC: the meteorological analysis section, the real-time communications and computer control section, and the



real-time decision support system section. The Division's organization chart is reproduced below:



Following is a description of each section and how it interacts with the others.

Operations Control Center

The OCC is a 24-hour a day, 7 day a week operation staffed by two Water Managers, a Lead Engineer, a Chief Consulting Engineer, and nine Supervisory Control and Data Acquisition (SCADA) Technicians.

The Water Managers are responsible for managing the surface waters of the District. They devise a daily water strategy and implement it by ordering gate changes and pumping operations as the circumstances warrant. Various inputs are considered by the Water Managers when formulating their water strategy. They require timely and reliable information on water levels in District canals, Water Conservation Areas, Lake Okeechobee and the Kissimmee Basin. The Water Managers also require information about the flow of water at various points in the system, the current settings of gates and pumps, maintenance schedules, and the availability of personnel. This information is provided by the SCADA Technicians who continually monitor the status of the system. The SCADA Technicians also analyze the

hydrologic data for inconsistencies and irregularities and, when found, notify the appropriate personnel so that the causes can be investigated.

In addition to the information provided by the SCADA Technicians, the Water Managers also rely on meteorological information when formulating their water strategy. This information is provided by the Meteorological Analysis Section that provides the Water Managers with rainfall measurements and rainfall forecasts. A further discussion of the meteorological analysis section follows.

After analyzing all of the relevant data, the Water Managers then determine what changes they want to make to the system and communicate these changes to the SCADA Technicians. The SCADA Technicians are responsible for carrying out the orders of the Water Managers. They do this either directly, through remote control access from the OCC, or by notifying the appropriate field personnel to make the changes manually.

The Lead Engineer and Chief Consulting Engineer provide engineering support to the Water Managers and coordinate with outside agencies, local governments, Section 298 Districts, and concerned citizens.

The OCC is also critical to emergency management. For certain emergencies, the OCC is considered the initial Emergency Operations Center and nucleus for emergency communications. It remains in this status until further determinations are made by the District's Emergency Manager.

Meteorological Analysis Section

The Meteorological Analysis Section provides support to the OCC and is staffed by two Meteorologists. The Meteorologists prepare a rainfall forecast twice daily, once in the morning and once in the afternoon. Depending upon weather conditions, forecasts may also be prepared on weekends. Their forecast divides the District into 14 areas. They predict the maximum inches of rain expected to occur in each area. This information is relayed to the OCC and is used to develop the daily water strategy. The forecast is also shared throughout OMD because it could impact field operations if heavy rainfall is predicted.

The Meteorologists also produce a Daily Rainfall Report, which estimates how much rain has fallen in each area of the District over the past 24 hours, past

week, and past month. This is then compared with the forecast to determine a daily forecast error and produce a monthly report of the forecast error.

The Meteorologists use radar display and lightening strike data obtained from the National Oceanographic and Atmospheric Administration Satellite.

The Meteorologists work closely with the District's Emergency Manager, especially during hurricane season (June 1 through November 30). During this period, they produce a daily Tropical Conditions Report that is a recap of the various systems in the tropics and their potential for impacts on the District's service area.

The Meteorologists also provide information pertaining to conditions such as lightning, winds, and rains to District field personnel to aid their scheduling of fieldwork.

Real-time Communications and Computer Control Section

The Real-time Communications and Computer Control Section consists of three information systems professionals who are responsible for the operation and maintenance of the Communication Control System that supplies the OCC with data regarding the C&SF system status. Included in the Communication Control System are data collection sensors, the microwave loop, and the data acquisition software. The status of the Communication Control System is monitored through the Supervisory Control and Data Acquisition (SCADA) system. The SCADA system allows for the gathering and transmission of real-time information from remote locations and permits the OCC Technicians to make gate changes from the OCC. In addition, an Automated Real-time Data Acquisition System (ARDAS) transmits current readings from various data sensors to the OCC by way of radio or telephone lines.

Real-time Decision Support System Section

The Real-time Decision Support System Section consists of a Systems Analyst who is responsible for developing the Consolidated Real-time Operations Support (CROS) System. It is intended that CROS, which includes both software and hardware infrastructure, provide the OCC with warnings and advice to aid in making real-time water control decisions.

Components currently in production or development include: the Auxiliary Operator Display (AOD) prototype, the Information Management System (IMS) database, Meteorological applications, Remote Database Entry and Retrieval, and Web based data displays.

Another major activity of this section is the documentation of structural information, including operational criteria.

OBJECTIVES, SCOPE, AND METHODOLOGY

The objectives of the review were to determine:

- whether the Operations Division is acquiring, protecting, and using its resources efficiently, and
- whether the Operations Division has complied with laws and regulations.

The scope of the review encompassed current operations of the Division, including interaction with internal and external customers.

In order to accomplish our objectives we:

- reviewed job descriptions within the Division,
- reviewed available operating criteria,
- reviewed reports of management and consultants including:
 - Operations Division Technology Assessment
 - Deloitte & Touche's 1996 Technology Assessment
 - Technical Functions at the SFWMD Classification and Requirements for Coordination and Integration
 - April 1997 Technical Staffing Evaluation
 - March 25, 1996, Science and Engineering Compensation Study
 - Technical Integration Process Formulation Final Report
- observed Control Room operations,
- interviewed Operation Division staff and other District staff as deemed necessary, and
- reviewed abstracts of computer systems and applications used by the Division.

Since we partnered with the management of OMD and a technical consultant engaged by them, the review does not include the same level of independence normally associated with an audit conducted in accordance with generally accepted government auditing standards. We are providing this information so that readers of the report can formulate their own opinion as to the extent they wish to rely on it. Notwithstanding, we believe the technical nature of the subject matter was such that the benefits of partnering with management maximized the usefulness of the review.

FINDINGS AND RECOMMENDATIONS

SUMMARY

Overall, the Operations Division is doing a good job of providing for around the clock monitoring and control of District water control structures and water bodies. Individuals surveyed from other divisions and departments, as well as those from outside the District, shared favorable observations with us. We did, however, find some opportunities for improvement.

Succession Plan: Currently, there is no succession plan in place for the Water Manager position. The Water Managers play a vital role in the operations room. Currently, there are two full time and one part-time person functioning as Water Managers. Promotion from within the division is limited because of the necessary professional and educational credentials. The Operations Division has agreed to formulate a succession management plan for key positions and has included the position of Chief Consulting Engineer in the FY 99 budget.

Systems Development: Over the past twelve years two large systems development projects have been undertaken with limited success. However, the need for a real-time operations support system still exists and Division programming staff has continued to develop components of it in-house. However, the OCC plans to hire a consultant to assist in reevaluating the project. We recommend that a multi-departmental task force be formed to provide needed technical assistance in moving this project forward. We also recommend that in-house programming be performed using some of the newer more common languages and done exclusively in a development

environment. The Operations Division agreed to implement these recommendations.

Documentation: The water management decision making process needs to be better documented. The Water Managers formulate a daily water strategy, which consists of opening and closing gates and/or starting or ending pumping operations. These orders are documented on a manual form, however, the reasons behind the specific structure and pump changes, or intentionality, is not documented. In certain circumstances the decision to increase the level of protection at one point in the system may be at the expense of another. It is important that Water Managers be able to recall, at a later date, why they took the action that they did. Also, a draft operating procedures manual needs to be completed. The manual would ensure consistency in operating results. OMD agreed to establish an internal working group to develop a system of documentation and to obtain assistance to complete the procedures manual.

Other: We also noted several other areas where there are opportunities for improvement including: enhancing the performance measurement system, performing annual planning, improving communications with field personnel, other agencies and the public, revisiting the shift premium computation to bring it more in-line with current wage levels, completing job descriptions for all personnel, and looking for ways to minimize reliance on manual record keeping systems.

SUCCESSION PLANNING FOR WATER MANAGER POSITIONS NEEDED

The two Water Managers play an essential role in managing water resources. They are on-call 24 hours a day and have the capability necessary to monitor the system when off site. The two Water Managers have 42 years of combined experience performing that function. Currently, there is no succession plan to replace Water Managers. A succession plan is needed because the Water Manager position is not easily filled. It's a position that requires a unique combination of experience and technical expertise.

Because of the complexity and uniqueness of the C&SF system, there is a substantial learning curve involved to become familiar enough with the system to function as a Water Manager. In addition, an advanced degree in hydraulic engineering or a related program is necessary for the position. This educational requirement precludes other Division personnel from assuming the responsibilities of Water Manager without obtaining significant additional education.

One of the Water Managers will be eligible for retirement in 5 years. Proper succession planning for Water Managers will ensure continuity of District knowledge and secure the safety of the District stakeholders and the environment.

The Operations Division did request a new Chief Consulting Engineer position as a re-directed position in FY98, however, it was deferred and put in the FY99 budget as a new position. In the interim, the former Operations Division Senior Engineer was transferred back to the Operations Division as a Chief Consulting Engineer and is currently working on a part-time basis. Also, the Operations Division's Director served as the Chief Consulting Engineer and can help in the event that an emergency arises.

Recommendation

- 1. A new Water Manager trainee position should be authorized and filled during FY99 with the goal of assuming full time duties in 3-5 years. Prospectively, the Division should formulate a formal succession plan for Water Managers.**

Management Response:

Management concurs with the recommendation. The Chief Consulting Engineer position will be recruited subject to approval of the Division's FY99 budget. The Division will begin development and institute a Succession Management Plan for all critical positions within the Division.

Responsible Division:	Operations Division
Estimated Completion Date:	March, 1999

PROGRESS NECESSARY IN SYSTEMS DEVELOPMENT AREA

Limited progress has been achieved in efforts to provide OCC staff with better automated tools. Over the past twelve years two major projects have been undertaken. A discussion of each project along with its current implementation status follows.

Operations Assistance and Simulated Intelligence System (OASIS)

In 1985, at the direction of the Executive Director, a multi-departmental committee was given the responsibility to choose one area of the District's operations for the development of an Artificial Intelligence application. The Committee selected the Operations Division for the evaluation of this cutting-edge technology. It was intended that OASIS be a knowledge-based advisory system for real-time water management. Primary features of OASIS included an intelligent warning system and an intelligent advisory system. The intelligent warning system was supposed to alert and provide information to OCC staff about abnormal conditions. The intelligent advisory system was supposed to make water management decisions. From 1989-1990 six contracts were entered into for OASIS related projects and evaluations totaling approximately \$421,000. All that is currently in use is the data model that was one component of the intelligent warning system. The remainder of the deliverables were unusable in the real-time operational application because of the complexity of the delivered system and lack of necessary real-time information required. However, it clearly demonstrated the need for consolidation of real-time operational information in a shared divisional database.

Consolidated Real-time Operations Support System (CROS)

CROS was conceived by the District in November 1988 as "a comprehensive decision support system for water management." It was anticipated that CROS would consolidate all of the information that is coming into the OCC from various sources. Sources of information include the telemetry system, dial-up modems, and field personnel.

In 1989, Andersen Consulting issued a District Technology Assessment that recommended that an economic analysis be performed of CROS. The economic analysis was subsequently performed by McDonnell Douglas in 1990 and is contained in their "Operations Division Technology Assessment." In their report, McDonnell Douglas listed the following benefits of implementing CROS:

- improved quality of decisions,
- improved operator effectiveness,
- reductions in data errors,
- providing a single source of data as opposed to islands of information,
- enhanced sharing of data among departments,
- better response to requests from the public, and
- lower operating costs.

The Operations Division Technology Assessment analyzed two options for CROS development. Option 1 was to engage an outside contractor to develop CROS at a cost of \$7.7 million over a ten-year period. Option 2, the alternative recommended by the consultant, was to use in-house resources to develop CROS at a cost of \$7.2 million over ten years.

Since the Technology Assessment was issued, a CROS Phase I development contract was executed and completed at a cost of \$178,000. In all, \$835,000 has been spent for CROS development. This cost includes personnel, computer hardware, and software expenditures which comprise the majority of the existing monitoring and control system infrastructure within the Division. While only moderate progress has been made in completing CROS over the years, Division staff have made some progress in CROS development while maintaining and expanding existing monitoring and control systems to meet the needs of the agency. CROS development efforts include elements such as:

- the completion of a Physical Network Editor,
- completion of the Data Model Editor,
- enhancement of the Data Model and Database, and
- development of an Auxiliary Operator Display (AOD) prototype which provides a contemporary set of tools for the Water Managers and Control Center technicians.

Major monitoring and control development efforts associated with CROS include:

- the Supervisory Control and Data Acquisition (SCADA) System,
- the Automated Real-time Data Acquisition System (ARDAS) and,
- various Oracle and Web based data entry, display, and warning applications.

It should be noted that a portion of the in-house CROS development work is being done using an outmoded language that only one programmer on staff is familiar with.

According to the Director of the Operations Division, the need for a fully functional CROS system still exists, and is even more critical to the agency's function than ever as a result of the complicated, new facilities proposed by the Everglades Forever Act and the Comprehensive Review Study of the Central and Southern Florida Project. It was reemphasized in the 1996 Technology Assessment where Deloitte & Touche recommended that the current state and direction of CROS be reevaluated, in light of emerging technologies and industry standards, by soliciting an independent consultant to have CROS requirements validated and the future direction reevaluated.

Recommendations

- 2. A District task force should be formed by the Operations Division, which includes representatives from the Executive Office, Office of Enterprise Engineering, Data Management Division, Electronics Support and Data Acquisition, and Planning, to assist the Operations Division in the evaluation and implementation of recommendations of the CROS reevaluation contract.**

Management Response:

Management concurs with the recommendation. This effort will be closely coordinated with the ongoing Water Resources Management Technical Integration process being initiated by the Executive Office and the inter-department development of the next generation telemetry system sponsored by the Water Resource evaluation and Operation and Maintenance Departments.

Responsible Division:	Operations Division
Estimated Completion Date:	March 1999

3. **The Operations Division should consider using a more common software language for in-house CROS development.**

Management Response:

Management concurs with the recommendation. This aspect has been part of the implementation plan for the development of the AOD prototype. During the initial phases of CROS development, the LISP programming language was the state-of-the-art, particularly in graphics based programs such as AutoCAD and other engineering based applications. However, the advent of much more powerful languages such as C, C+ and C++ have much greater programming potential, and are in much greater use by programmers today than the older LISP code. As a result, the basic premise of the AOD Implementation Plan proposed in the FY99 Budget is to identify and develop a process to migrate the existing AOD prototype to a production scale computer application using the latest computer technologies available.

Responsible Division:	Operations Division
Estimated Completion Date:	January 2000

4. **The CROS software production environment should be segregated from the software development environment.**

Management Response:

Management concurs with the recommendation. This effort was initiated by the Real-time Communications and Computer Control Section several months ago in an effort to avoid systems down-time resulting from ongoing program development efforts. The effort continues, but is hampered to a degree by limited resources and competing programming priorities between the Division, Department and internal District customer requirements.

Responsible Division:	Operations Division
Estimated Completion Date:	Pending receipt of management comments.

DOCUMENTATION OF WATER MANAGEMENT DECISIONS SHOULD BE IMPROVED

It is important to document that the system is operated in a consistent manner, yet still maintain the flexibility to deal with unique circumstances in an effective manner. Water Managers do not document the reasons, or intent, for the orders that they give. When the Water Managers formulate their daily water strategy, they document their orders on a manual form. These orders include such things as opening or closing gates on water control structures and ordering or ceasing pumping operations. However, the reasons for giving the orders is not documented by the Water Managers.

It is important to document the intent underlying the Water Manager's orders because under certain circumstances the decision to increase the level of protection at one point in the system may be at the expense of another. Documenting the decision making process will allow Water Managers to recall, at a later date, the reasons for the action that they ordered.

A fully functional CROS system would create documentation of intent by allowing the assignment of a particular pre-defined operational mode for a given geographic region. For example, after being notified of an impending storm event, an operator could place a particular basin in the "pre-storm" operational mode. The CROS system would then identify all the flood control structures within the basin and suggest adjustments to their operation ranges to coincide with the flood control goals identified for that basin by the Army Corps Of Engineers operational policies. The CROS system would simultaneously document the operational changes and identify the associated intent within the hydrologic database for future reference.

Absent an automated system such as CROS to provide documentation of the Water Managers intent, other alternatives might include writing a narrative after a storm event or making an audio recording during the event.

Recommendation

- 5. The Water Managers should devise a system to better document the decision making process.**

Management Response:

Management agrees with the recommendation. The Operations Division will initiate a dialog with the Office of Counsel and the Executive Office to identify how best to implement this recommendation. After a definition of the most appropriate type and scale of documentation is determined, the Operations Division will establish an internal working group to develop a system of documentation and an appropriate implementation plan.

Resolving the issue of operational intent has long been a goal of the Operations Division. It was considered a central function in the initial concept of the CROS decision support system. However, it is important to understand that literally hundreds of individual water resource decisions are made every day; from the decision to open a single gate by a fraction of a foot to supply additional water to an area, to the emergency release of large volumes of water in advance of a major storm across a number of drainage basins. To document all of these decisions will require a tremendous amount of effort on behalf of the water managers. Therefore, it is imperative that a simple, convenient system of documentation is developed that will not only serve the need to document intentionality, but allow water managers adequate time to thoroughly think through operational decisions during emergency conditions.

Responsible Division:	Operations Division
Estimated Completion Date:	March 1999

AN OPERATING PROCEDURES MANUAL SHOULD BE COMPLETED

The Operations Division does not have a complete Operations Manual that contains current finalized Standard Operating Procedures. There is an Operations Technician Manual that was drafted in July 1997 by Operations Division staff that requires updating. Several of the SCADA Technicians were supposed to work with the programming staff to update and improve the manual, however, the Division Director has indicated that a consulting firm may be engaged to perform the update.

A procedures manual is needed in order to ensure consistency of operations by providing specific guidance to the staff. While our limited testing of compliance with the Army Corps of Engineers Master Water Control Manuals revealed no deviations, the Water Managers have indicated that there are situations when they must exercise discretion and deviate from Corps guidance. The procedures manual would provide specific criteria for allowable deviations from Corps guidance. Written procedures also serve as a training tool for new staff members. Our review indicated that written procedures could be helpful in the following areas:

Shift Change Procedures

There are two SCADA Technicians on duty in the control room at all times. A typical shift change involves one SCADA Technician leaving and another arriving. The incoming Technician must completely familiarize him/herself with the status of the system in about 30 minutes time. After that, the incoming Technician is expected to perform all of his/her assigned duties and responsibilities. Seamless shift transitions are important in the OCC, especially during storm events, because the incoming person must be able to quickly pick up where the outgoing person left off. While all of the Technicians generally perform the same activities to familiarize themselves with the system, the procedures should be formalized to ensure consistency and continuity between shifts. A shift change checklist keyed to the standard operating procedure would also ensure completeness because the Technicians have familiarized themselves with everything that they are required to.

Division of Responsibilities Between Shift Personnel

There are no written guidelines that define the division of responsibilities between shift personnel. As previously stated, there are two Technicians on duty at all times and because of how the shifts are staggered no two Technicians spend more than 4 hours together. There is some confusion regarding which Technician should be considered “in-charge” for the shift and what exactly being in-charge entails. There are currently nine Technicians. Five of them are S-4 Spec SCADA Systems Technician, three are S-3’s and two are S-1’s. Because there are just enough technicians to cover the 24-hours a day, seven days a week schedule it is not always possible to schedule Technicians of different levels. Designating an “in-charge” Technician for each shift would promote accountability within the OCC and better clarify the roles and responsibilities of the Technicians.

Standards of Documentation

While there are documentation functions within the OCC that are clearly understood by staff, there is no standard criteria established regarding documentation. Documentation is important because it ensures that complete information is available to decision-makers and other interested parties. Having a standard for documentation would ensure that all personnel know what to document, thus promoting consistency and completeness.

Recommendation

- 6. The Operations Division should complete the preparation of its Operating Procedures Manual.**

Management Response:

Management concurs with the recommendation. The FY99 budget presently contains funding for a consultant contract to take the staff comments generated to date on the draft Operations Manual and prepare a final document.

Responsible Division:	Operations Division
Estimated Completion Date:	June 1999

PERFORMANCE MEASURES NEED TO BE ENHANCED

The FY99 budget process required all District Divisions to develop performance measures to evaluate success towards achieving their respective goals and objectives. Currently, the Operations Division utilizes a suite of performance measures developed during the budget process that succeeds in providing a basic “benchmark” on performance annually; particularly with regard to flood control and water supply. However, these measures should be enhanced to reflect environmental elements as well. Furthermore, it may be possible to develop a series of more detailed performance measures that track compliance with specific guidelines prepared by the U.S. Army Corps of Engineers in the design of the project.

When developing performance measures the following should be considered:

- Performance measures should flow from the Division’s goals and objectives.
- Performance measures should reflect the ability of the Division’s management to influence the achievement of output or outcome targets.
- Division staff should have a role in developing performance measures.
- Performance measurement systems should collect and report on a few key measures and be balanced by demonstrating different dimensions of performance, such as quantity, quality, efficiency, and cost.
- Performance measurement systems should include qualitative, in addition to quantitative, performance information and interpretation of performance results.

Recommendation

- 7. The Division should continue implementation of the performance measures developed through the budget process and develop additional outcome oriented measures consistent with the Divisions' mission and operating criteria established by the U.S. Army Corps of Engineers.**

Management Response:

OMD concurs. Because of resource constraints within the Division, the performance measures developed through the budget process were selected so they could be independently generated easily by the Water Resource Evaluation Department, Division of Hydrologic Monitoring and Evaluation. However, new performance measure development resulting from the Comprehensive Review Study of the Central and Southern Florida Project effort will be evaluated for use by the Division as future performance indicators.

Responsible Division:	Operations Division
Estimated Completion Date:	June 2000

ANNUAL PLANNING SHOULD BE PERFORMED

The Operations Division does not prepare an annual plan. The Division has indicated that they are in the process of preparing a long range (5 year) plan, however, no short-range plan has been prepared.

Planning includes setting goals, developing strategies, and outlining tasks and schedules to accomplish those goals. Long-term planning generally corresponds to the stated goals of the organization and an assessment of the changes that will occur in the future. How the Division plans to monitor water levels and control the flow of water through the Everglade's Construction Project proposed Stormwater Treatment Area's would be encompassed in long-term planning.

Short-term plans encompass specific technical areas such as operations, scheduling, production, and personnel issues that are necessary to guide the

Division to meeting its long-term plans¹. Staffing levels and systems development milestones would be encompassed in short-term planning.

Recommendation

- 8. The Operations Division should prepare an annual plan that complements the long-range plan.**

Management Response:

Management concurs with the recommendation. Work on the annual plan will begin after the 5 year plan is completed.

Responsible Division:	Operations Division
Estimated Completion Date:	March 1999

OPPORTUNITIES TO IMPROVE COMMUNICATIONS

The Operations Division has an opportunity to improve communications with field station and pump station personnel as well as with outside parties. Communications between the OCC and the Field/Pump Stations is a very critical element of the divisions' mission. The staff of the OCC is virtually in constant communication with the various external sites within the agency focused on coordinating the movement of water.

Field station personnel indicated that they are not always informed, by the OCC, of remote gate changes made during the evening and early morning hours. Opening gates increases the flow of water through a structure and may result in floating debris that needs to be removed from water control structures. Field and pump station management need to know when all remote gate changes occur so that they can assign personnel to address this problem. Operations Division management contends that communicating the hundreds of gate motions and pump operations that occur everyday across the District to distributed locations is presently beyond the ability of the agency's resources; particularly during evenings and weekends. Since the remote sites do not maintain constant 24-hour per day coverage, it is difficult and sometimes costly to keep field personnel informed of all activities carried

¹ D. L. Bates and David L. Eldredge, Strategy and Policy, 2nd ed. (Dubuque: Wm. C. Brown Publishers, 1984)

out in the OCC over a 24 hour period. This is not the case during storm conditions when constant, 24-hour per day, communication between the OCC and remote stations is critical to successful operations of the C&SF system.

Pump station and field station personnel also expressed concern that they were not being informed, on a timely basis, of when pumping operations would commence. Both pump station and field station personnel engage in pumping activities. Pump crews generally have worked a full day and are summoned back to the stations in the evening to commence pumping operations to avoid overnight flood impacts. When enough warning has been provided by the OCC they can go home early to rest before reporting back on duty for a full evening of pumping operations. The Operations Division acknowledges that this occurs frequently in the wet season due to the unpredictability of late afternoon thunderstorms.

Operations Division staff has been developing an internal web site (the “I-WEB”) that currently provides limited information about system status. Consideration should be given to expanding the I-WEB to provide for continuous communication between the OCC and all field stations and pumping sites. An expanded system could convey operational instructions and report compliance back to OCC from the field. The computer record of this communication would form the documentation of the action taken, including the time and the person responsible for taking the action.

Various external parties such as local governments and local water control districts could benefit if they were provided with real-time hydrologic data and had an efficient means by which to communicate their actions with the District. Currently, the method of communication with parties external to the District is by telephone. The District’s external web-site (the “X-WEB”) could be expanded to include an operations page to inform stakeholders of District operational decisions and other water management related data. An e-mail return address could be provided to receive data and comments back from such users and would provide an additional supplement to the current “phone-in” system for external users of the system.

Recommendations

- 9. The OCC should initiate an internal group comprised of OCC personnel and field personnel to investigate communication issues and develop a comprehensive plan to make improvements. Utilization of communication mediums such as telephone, video conferencing, internet, and CMMS should be considered.**

Management Response:

Management concurs with the recommendation.

Responsible Division:	Operations Division
Estimated Completion Date:	June 1999

- 10. The Operations Division should further explore expanding its external web site and other computer applications to provide for the sharing of data with other parties, such as secondary system users, the public, and other agencies.**

Management Response:

Management concurs with the recommendation. The Operations Division will continue to explore expanding its external web site and other computer applications to share more information with the public and other agencies.

Since November 1997, the Operations Division has posted all of the real-time operations data by geographic region on both the District's internal and external web sites. These sites contain various combinations of information such as water levels, gate positions, pump speeds, and 24-hr rainfall accumulations for all monitored structures. This site utilizes the Division's IMS database to obtain information from the District's microwave telemetry system, the remote cell phone data loggers, USGS satellite data, as well as manual readings collected throughout the day.

Plans are underway to provide a graphic, map based, format to access this information in future revisions. Manpower constraints and programming priorities commonly hinder progress in this area.

Responsible Division:	Operations Division
Estimated Completion Date:	Ongoing

SHIFT PREMIUM AMOUNT NEEDS TO BE RECOMPUTED

The Operations Division is the only Division in the District that conducts around the clock operations. Shift work is necessary in order to accomplish this. To compensate workers for the shift work, the District pays a premium of \$0.60/hour to employees who work other than a normal shift. The specifics of when an employee is entitled to shift premium will be outlined in the District's forthcoming HOURS OF WORK AND OVERTIME POLICY. The \$0.60/hour has been effective since November 1993 and was based on a survey that was performed of seven other governmental agencies within the District's service area. Most of the respondents to the survey paid a shift premium of 5% of the hourly rate.

The \$0.60/hour was computed by taking 5% of the average of the hourly rate of 17 positions that were subject to shift work.² The SCADA Technicians were at the higher end of the salary range than the other filled positions in the analysis and six positions in the analysis were vacant positions³ for which the hourly rate was substantially lower than that of any of the filled positions. Excluding the vacant positions from the analysis would have resulted in a \$0.75/hour shift premium computation. If just the SCADA Technicians positions were used in the computation, the analysis would have resulted in \$0.84/hour. Because the SCADA Technicians hourly rates were higher than the other positions in the analysis, the \$.60/hour that was decided upon was 3.6% of the SCADA Technicians average hourly rate, as opposed to the 5% target, when shift premium was instituted.

² The computation actually resulted in \$0.67, however, \$0.60 was ultimately decided upon.

³ The Hydrogeology Division was recruiting for six Engineering Technicians for the second shift. The rate of pay for these positions was \$10.90/hour compared to the SCADA Techs who averaged \$16.72/hour.

Since this computation was performed in 1993, salaries have increased, further minimizing the value of the \$0.60/hour shift premium. If the same SCADA Technician salaries were recomputed based on their current hourly rate, the shift premium for SCADA Technicians, if 5% was still reasonable, would be \$0.98/hour. Further, the \$0.60/hour presently paid represents only 3.1% of those same four SCADA Technicians' current average hourly wage.⁴

Recommendations

- 11. The shift premium amount should be adjusted based on current hourly wages of employees actually performing shift work.**

Management Response:

The shift premium should be adjusted as a flat rate uniformly applied to each individual or given as a percentage off midpoint (labor market competitive rate). The shift premium study will assist in making that determination.

Responsible Division: Human Resources Division
Estimated Completion Date: August 5, 1998

- 12. Human Resources should update the survey of shift premium pay practices.**

Management Response:

Human Resources is currently conducting a survey of tri-county area participants.

Responsible Division: Human Resources Division
Estimated Completion Date: August 5, 1998

⁴ For the same technicians used in the analysis. Two additional technicians have since been added.

13. **Instead of computing a flat rate shift premium based on an average of District shift worker's pay, Human Resources should consider paying a shift premium based on a percentage of each workers actual hourly wage.**

Management Response:

Human Resources recommends a flat rate shift premium to all employees based on the labor market rather than taking an average of District shift workers pay to determine the shift premium. In addition, there should be a third shift premium (higher) than the second shift premium. Staff is currently surveying the labor market and will have the information by August 5.

Responsible Division:	Human Resources Division
Estimated Completion Date:	August 5, 1998

TWO KEY POSITIONS REQUIRE JOB DESCRIPTIONS

There were no job descriptions for two important individuals in the Operations Division, the Supervising Professional-Information Systems and the Chief Consulting Engineer.

The District Salary Administration Policy 3.40100, states that "each Department/Office shall be responsible for developing and maintaining the job descriptions of its employees in order to have a clear understanding of their job function."

The policy further states that "job descriptions provide a clear understanding of the duties and responsibilities of a job for both the supervisor/manager and job incumbent. Job descriptions facilitate and improve internal communication and overall coordination and are essential to organizational analysis and improvement. Job profiles aid in evaluating jobs, conducting performance reviews, serve as benchmarks in salary surveys, and are used for recruitment, selection, and training purposes."

Recommendation

- 14. Job descriptions for the Supervising Professional-Information Systems and the Chief Consulting Engineer should be prepared by the Operations Division.**

Management Response:

Management concurs with the recommendation.

Responsible Division:	Operations Division
Estimated Completion Date:	August 1998

OPPORTUNITIES TO REDUCE MANUAL RECORD KEEPING SYSTEMS

OCC staff manually prepares a Daily Operations Log, Blue Cards, Avoid Verbal Orders form (AVO), and the Hydrograph (Plot Book).

The Daily Operations Log is a 6"x9" steno pad used to record actions taken by, or information received by, the OCC staff. A Blue Card is a card that is filled out when the OCC staff receives a call in the Control Room from external parties. The AVO is where the water managers document their orders. The Plot Book is a manual plotting of water levels at various key locations.

There are many benefits to be derived from using an electronic medium as opposed to paper documents. These include reduced storage space requirements, ease of retrieval and transmission, ability to publish on the District's Web site, the ability to perform searches on key words, access to multiple users, ease of editing, readability, spell checking, data manipulation, and ease of data extraction.

Recommendation

- 15. The Operations Division should consider automating the Daily Operations Log, the Blue Cards, the AVO form and the Plot book.**

Management Response:

Management concurs with the recommendation. Over the past several months, much work has been done to migrate many of the “paper-based” documentation functions to electronic formats. The Daily Water Readings form was recently migrated to an EXCEL format by one of the SCADA Technicians with assistance from the programming staff. This application reads the IMS database and populates the spreadsheet in seconds; a function which normally took all day in manual form. In addition, many other functions such as documentation of DDSP/DDMP settings, commonly used phone numbers, commonly available maps, and other information has recently been put in various electronic formats available to all OCC staff.

Responsible Division:

Operations Division

Estimated Completion Date:

January 2001